Endodontics, Endodontic Retreatment, and Apical Surgery Versus Tooth Extraction and Implant Placement: A Systematic Review

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Abstract

Introduction: The aim of this systematic review was to answer the following clinical question: Which is the best treatment option for a pulpally involved tooth? **Methods:** An electronic search was conducted in the Cochrane, PubMed (MEDLINE), and ScienceDirect databases between December 2015 and February 2016. A manual search was also performed. The inclusion criteria were randomized clinical trials, prospective or retrospective cohort studies, and cross-sectional studies performed on humans with at least 1 year of follow-up and published within the last 10 years. Two researchers independently screened the title and abstract of every article identified in the search in order to establish its eligibility. The selected articles were classified into different levels of evidence by means of the Strength of Recommendation Taxonomy criteria. **Results:** Sixty articles met the inclusion criteria for this systematic review. The survival rate of single-tooth implants was greater than the success rate of the distinct conservative treatments. However, among comparative studies, no important differences between both treatments were observed until at least 8 years later. **Conclusions:** The endodontic treatment and the implant placement are both valid and complementary options for planning oral rehabilitation. Although a level B recommendation can be stated, these results come from retrospective comparative studies because there is a lack of randomized clinical studies comparing both types of therapeutic options. *(J Endod 2017;43:679–686)*

Key Words

Apical surgery, endodontic retreatment, endodontic treatment, outcome, single-tooth implant

Significance

This article evaluates the current scientific literature regarding the preferred treatment option (conservative versus extraction and placement of an implant) for a pulpally involved tooth in terms of survival rates. There is great variability among clinicians in treatment planning for teeth with a questionable prognosis. Current evidence shows no differences between both options although there is a lack of randomized clinical trials.

According to the American Dental Association's *Glossary of Dental Clinical and Administrative Terms*, dentistry is a branch of medicine that is involved in the evaluation, diagnosis, prevention, and/or treatment (nonsurgical, surgical, or related procedures) of diseases, disorders, and/or conditions of the oral cavity, maxillofacial area, and/or the adjacent and associated structures and their impact on the human body. The standard of care of a nonvital tooth is endodontic treatment to preserve the natural tooth (1, 2). There is great variability among clinicians in treatment planning with a pulpally involved tooth with a questionable prognosis (1). Although in some cases this decision may be controversial, it should be based on the remnant tooth structure (3), patient preferences, and cost-effectiveness (2). Nowadays, dental implant placement is a widely accepted treatment option, and it is supported by high survival rates. However, there are many factors that can affect the result of implant treatment like implant position, restoration type, bone quality, and smoking habits (4).

It seems that endodontically treated teeth and single-tooth implants have similar outcomes (1, 2, 4). However, the lack of standardized tools for evaluating the results and the different biological mechanisms make it difficult to directly compare both treatments. Although the success of root canal treatment, retreatment, and apical surgery is defined by complete radiographic healing and the absence of clinical signs and symptoms, the majority of studies on dental implants only refer to survival rates and not to success rates (4–6). The fact that time could affect the treatment prognosis (7, 8) is an interesting issue that could help to make decisions based on the long-term expected results.

The aim of this systematic review was to answer the following clinical question: Which is the best treatment option for a pulpally involved tooth? Then, the following PICO (patient, intervention, comparison, outcome) question was designed: In a patient who has a tooth with pulpitis, necrosis with or without a periapical lesion, in the presence or absence of symptoms, and without a radicular fracture, does the conservative

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treatment (endodontic treatment or retreatment and/or apical surgery) compared with tooth extraction and implant placement achieve higher survival rates?

Materials and Methods

This article follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses declaration (9). An electronic search in the Cochrane Library, PubMed (MEDLINE) and ScienceDirect databases was conducted between December 2015 and February 2016. The designed search strategy was: ((“Root Canal Therapy”[Mesh]) AND (“Dental Implants”[Mesh])) OR (“endodontic treatment”[tw] OR “surgical endodontic treatment”[tw] OR “periapical surgery”[tw] OR “endodontic retreatment”[tw] OR “endodontic surgery”[tw] OR “Dental Implants, Single-Tooth”[Mesh]) AND (“outcome”[tw] OR “Decision Making” [Mesh]). In addition, a manual search was performed in the following journals: *Clinical Oral Implants Research*, *International Endodontic Journal*, *International Journal of Oral and Maxillofacial Implants*, *Journal of Endodontics*, *Journal of Periodontology*, *Journal of Oral and Maxillofacial Surgery*, and *Oral Surgery Oral Medicine Oral Pathology Oral Radiology*.

The last search was performed on February 3, 2016. Two researchers (A.C.R. and A.S.T.) independently screened the title and abstract of every article identified in the search in order to establish its eligibility. A Cohen kappa for each database was calculated to determine the interrater reliability. Afterward, the full text of the selected articles was assessed for a definitive inclusion in the systematic review. A third reviewer (C.G.E.) resolved any discrepancies. The inclusion criteria were randomized clinical trials, prospective or retrospective cohort studies, and cross-sectional studies performed on humans with at least 1 year of follow-up and published within the last 10 years (2006–2016). No language restriction was applied. The exclusion criteria were nonhuman studies, review articles, case series, case reports, and studies based on surveys or expert opinions.

The selected articles were classified into different levels of evidence by means of the Strength of Recommendation Taxonomy criteria (10). The characteristics collected from the studies in order to perform a qualitative analysis were based on the type of intervention, outcome (success, survival, and failure rates), assessment criteria, and follow-up time.

Results

The flowchart according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines is provided in Figure 1. A total of 1229 articles were obtained in the electronic search, and 15 articles were retrieved from the manual search. Sixty articles were selected for full-text assessment. The Cohen kappa was 1 for the Cochrane Library, 0.99 for PubMed, and 0.86 for ScienceDirect. After reading the complete articles, 14 of them were excluded (11–24); the reasons are explained in Figure 2. Unfortunately, the full text of 12 articles could not be obtained. Finally, 45 articles were chosen to

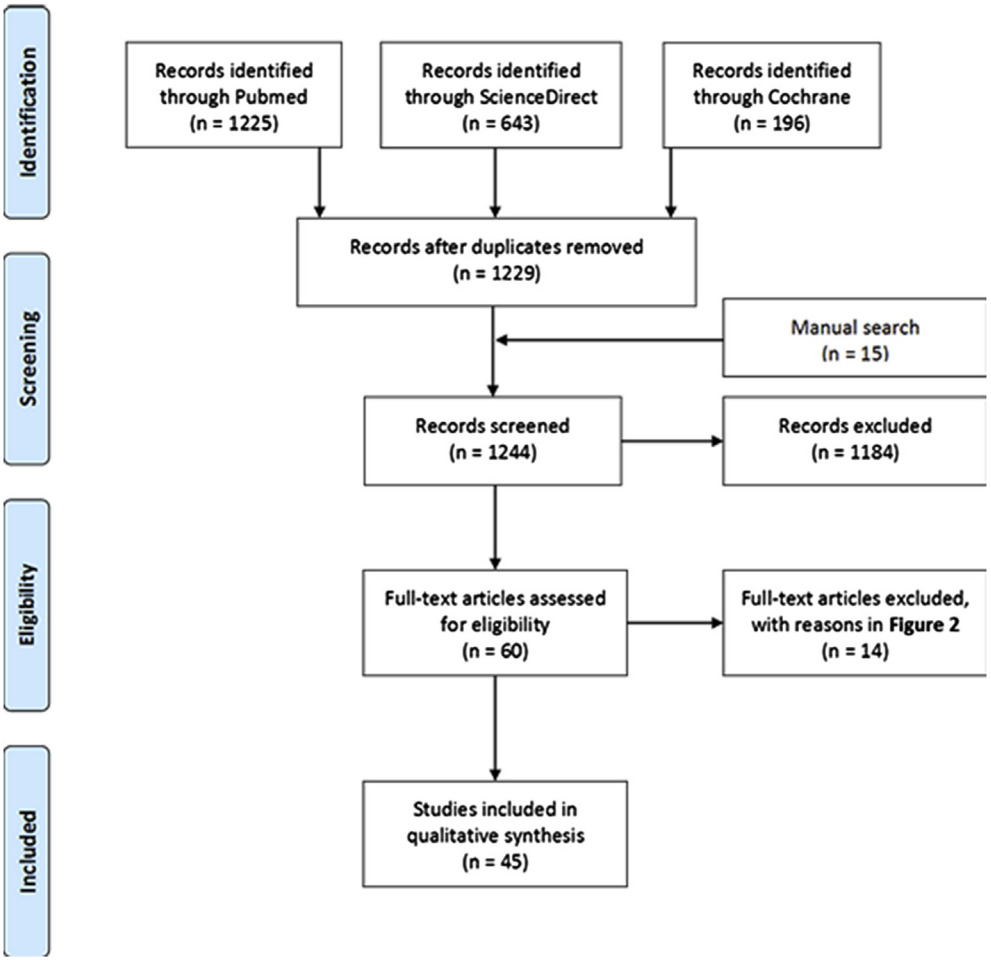

Figure 1. A flowchart of articles according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines.